



# The AGATE Flier

Information on developing technologies for business and personal transportation aircraft

Volume III, Issue 1

## Revitalization Efforts Soar With AGATE

**A** GATE is helping to pave the way to a safer, more affordable, and more convenient means of personal, business, and recreational travel. The development of new technologies, implementation of new training methods, and means for certifying their operational use are improving the capacity and accessibility of our national airspace system. Through this innovative spirit, AGATE is making the romance and freedom of personal air travel available to more people.

"AGATE is making significant progress. Seventy companies are working together with government toward a common goal, revitalizing general aviation, and we are beginning to see products being prepared for market introduction," said Randy Nelson, AGATE Executive Council Chairman.

AGATE's greatest contribution is in the area of standards for new technology applications. In addition to eliminating many of the negatives associated with small airplane operations, these cost-effective technologies are making flying

cation, navigation, and surveillance systems. Many of these technologies were proven in the Heli-STAR project conducted at the Olympic Games in Atlanta last summer. Other advancements are also being made with databus and datalink communication systems. In 1996, AGATE member NavRadio was awarded the Aviation Week & Space Technology Laurels Award for their development of the low-cost VDL Mode 2 airborne radio. The radio provides pilots with higher bandwidth communication capability at lower cost.

AGATE members are also working to implement propulsion control systems that reduce pilot workload while enhancing aircraft performance. Flight tests of highly efficient, simple



**E. Randy Nelson**  
Chairman, AGATE  
Executive Council

"AGATE is making significant progress. Seventy companies are working together with government toward a common goal, revitalizing general aviation, and we are beginning to see products hit the market."



**AGATE is facilitating the emergence of new aircraft communication technologies.**

more desirable to pilots. New cockpit display and communication technologies are being developed and test flown aboard aircraft to alleviate pilot workload. For example, no longer will pilots have to rely on radio voice cues for flying through adverse weather conditions. Instead, AGATE-developed computer-generated cockpit displays will graphically guide pilots around harsh weather to their destinations.

New free flight technologies will enable pilots to fly along their chosen aerial routes with less reliance on ground communi-



**A Cirrus Design Corp. experimental configuration constructed with advanced composites and airbags undergoes crash tests at the NASA Langley Impact Dynamics Facility.**

(Continued on page 6)

From the desk of Dr. Bruce J. Holmes  
**Program Manager**  
**NASA**



## *AGATE at Mid-Life*

AGATE at mid-life. In operation since 1994, AGATE is approaching the half-way point in its project life cycle. What has AGATE accomplished? What is left to do? What happens after AGATE? The answers to these questions lead to our original goal of revitalization of the U.S. general aviation industry. The results will mean new levels of industry competitiveness in airplane price, performance, and quality.

### *What has AGATE accomplished?*

AGATE's partners have chosen to collaborate to create a future none of us could create independently. As in any collaboration, AGATE members satisfy a carefully selected subset of their strategic corporate objectives through the alliance. Each member has established their own level of practical expectations for contributing to and gaining from AGATE collaboration. Those mutual expectations form the basis of the alliance. NASA's strategic purpose is to stimulate revitalization of U.S. general aviation. At the highest level AGATE has accomplished a national technology strategy to achieve this purpose.

In the simplest language possible, AGATE is:

1. A national public standards organization for general aviation manufacturers and training industries,
2. An industry forum for the establishment of best design practices and guidelines, and
3. A partnership to reduce the risks of certification of products derived from new technologies.

These functions support the prime AGATE products: Guidelines, Standards, and Certification Methods (GS&C). Revitalization depends on AGATE's success in establishing GS&Cs that are robust enough to survive the industry's product development decision-making once AGATE is complete. Those industry decisions will address such technologies as aircraft computer resources, computer operating systems, flight systems operating and hardware architecture, datalink radio architecture, Flight Information System (FIS) datalink infrastructure architecture, materials properties, airbag design standards, electronic engine control system architecture, and new pilot training and operating procedures in AGATE-derived aircraft. AGATE has succeeded in establishing and operating a unique industrial partnership necessary to accomplish these key functions.

### *What is left to do?*

AGATE is transitioning beyond its technology-driven formative years into the next critical System Synthesis phase.

During this transition, AGATE investment decisions will become increasingly driven by market objectives. This next phase requires complete synthesis of AGATE component concepts into a whole system. Pieces of AGATE must coordinate and

interact. These interactions are between the various AGATE Work Packages. It is during this phase that we will reap the benefits of investing in sound systems engineering documents and configuration management processes. This phase requires that we assemble and fly the AGATE system. The AGATE System Standards Team's (SST) testbed aircraft will serve these purposes in the coming months. Based on demonstrating the AGATE features and capabilities in the real world flight environment, we will prepare for the final phase of the AGATE project: publication of the GS&Cs.

### *What happens after AGATE?*

As AGATE draws to a close in 2001, industry will be prepared for new levels of competition in the marketplace for both retrofit and new products. On the government side, NASA's strategic plan supports the long-term vision for a small aircraft transportation system. The NASA Administrator's objectives for national aeronautics investments include technology support for the goal of 20,000 new aircraft deliveries per year within 20 years. Several Federal investments move us closer to that vision, including AGATE, along with the General Aviation Propulsion (GAP) Program, the Advanced Air Transportation Technology (A<sup>2</sup>T<sup>2</sup>) Program, the FAA Flight 2000 Program, and the new NASA Aviation Safety Research Program (ASRP). AGATE will deliver vital GS&Cs for key avionics and airframe features we have chosen for investment. We will have exciting new engines from GAP, new free flight capabilities from A<sup>2</sup>T<sup>2</sup> and Flight 2000, with new levels of air transportation system safety from ASRP. The results of these investments will give us the basis for revitalization of the existing markets for general aviation aircraft. The rest of the story for a small aircraft transportation system requires airport infrastructure planning and investment on a national scale. Our current Federal research programs are not chartered to address infrastructure. Infrastructure investment decisions lie with the Federal, State, and local private and public sectors. Based on the historical precedent of the automobile, the creation of the practical vehicle must come first. When the practical automobile was ready, the infrastructure (highways) followed. AGATE and its sister programs will deliver practical aircraft. Highways in the sky will follow.

The AGATE membership has grown slightly and the outyears budget is stable. The 1997 partners to date include 38 Principal, 4 Associate, 24 Supporting, and 3 Government Members. These are the partners and programs committed to bringing revitalization to U.S. general aviation, and a small aircraft transportation system to the United States. □

# SBIR/STTR: Ingredients for Success

## Displays Showcase General Aviation Successes

**S**mall Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR) Program companies are showcasing innovative general aviation technology in NASA's Oshkosh Exhibits. The SBIR/STTR program is serving a crucial role in achieving General Aviation (GA) revitalization and advancing the U.S. aerospace industry. The establishment of relations between businesses, government, and universities through SBIR/STTR is leading to innovation as shown in these advanced displays. The displays will be exhibited at the annual Oshkosh Fly-In this year.

The exhibit "NASA Partnership With Small Business" highlights the NASA/SBIR success story. New propulsion technologies have been a major focus of NASA/SBIR related activity. One of the most exciting systems to be recently developed is the single lever power control (SLPC) system. The exhibit stresses the advantages of this new simplified control system, which eliminates the need for multiple engine controls. A portion of the exhibit, developed by Aurora Flight Sciences Corporation, stresses their concept, a FADEC/mechanical system, and its ease of installation in aircraft. The system is being test flown on general aviation aircraft and unmanned aerial vehicles (UAV).

In another section of the exhibit, the Global Aircraft Corporation presents several of their developments designed to enhance aerodynamic performance as well as the production of their highly efficient GT-3 trainer. The design developments include Global's Quasi-Constant Speed Composite Propeller—a lightweight propeller designed for improved aircraft performance—and new propeller/cowl systems.

In a panel dedicated to improving airfoil designs, Innovative Aerodynamic Technologies sheds light on advancements in computer technology. Their LAMDA product (Laminar Airfoil Manager for Design and Analysis), enables engineers to effi-

ciently design better airfoils.

In a separate exhibit, Seagull Technologies highlight some of the latest enhancements brought to the general aviation cockpit. The exhibit highlights advancements in cockpit instrument/display systems including multifunction navigational and weather displays, a GPS/inertial flight sensor system known as Flight Sense, and a datalink communication system known as FlightLink.

An exhibit by Mod Works illustrates the movement toward simplification in the cockpit design for human factors. Mod Works' and Florida Institute of Technology's Instrumentation Integration and Certification procedures promise to reduce the number of control panel instruments and provide aircraft retrofitting flexibility and affordability.

Cox & Company, Inc. contributed an exhibit that explains the company's joint development with Innovative Dynamics, Inc. of an advanced deicing system. Their Electro-Mechanical Expulsion De-icing System (EMEDS) saves weight and cost for ice protection.

The theme of flier safety is stressed in an exhibit prepared by the National Institute for Aviation Research (NIAR) at Wichita State University. The exhibit focuses on the success and benefits of energy-absorbing structures developed by Terry Engineering, NIAR, and Cirrus Design through SBIR funding.

The SBIR/STTR displays make for true attention grabbers at Oshkosh. The exhibits portray the true essence of the general aviation movement today and feature interactive computer attractions that will provide audiences with excitement, enjoyment, and an enlightening education of leading-edge advances being made in general aviation flight. □



**The General Aviation SBIR/STTR displays feature the latest in general aviation technologies and interactive computer attractions.**

## AGATE Holds First Certification Workshop

### Air AGATE Works to Set General Aviation Standards

**F**ollowing up on what proved to be a productive year for general aviation last year, the AGATE Alliance held its first Certification Workshop at the Sheraton City Center Hotel in Washington, DC, on May 19-21. The workshop focused on strategies for setting standards for aircraft technologies and operations. Seventy-five AGATE members attended sessions covering issues ranging from parts certification to flight testing and training. Tim Smyth, FAA ACE-111, was the Air AGATE Certification Workshop Coordinator.

One of the most extensive sessions involved the application processes for Type Certifications (TC) and Supplemental Type Certifications (STC) under 14 CFR, part 21. Regulations for parts manufacturing according to Parts Manufacturing Association (PMA) standards were discussed, including how to secure approval for production of specific parts through a manufacturing certificate. Inspection requirements for parts, airworthiness approval, and experimental certification issues were also addressed for fixed-wing aircraft as well as rotorcraft. The discussion was led by Bruce Kaplan, FAA AIR-130.

Another matter of great interest under FAR Part 21 has been changes in the TSO (Technical Standard Order) aircraft design approval procedures and TSOs developed by the Radio Technical Commission for Aeronautics (RTCA). The types of TSOs are now available on the Internet.

On May 20, participants engaged in discussions related to aircraft systems and propulsion as covered under parts 23, 33, and 35 of 14 CFR. Speakers David Showers, FAA ACE-111, Mark Rumizen, FAA ANE-110, and Jay Turnberg, FAA ANE-110, led briefings on aircraft design and structural certification, and flight airworthiness standards for engines and propellers. The aircraft design and structures portion of the talks included certification

and safety requirements for airframes, seats and restraints, and wings/winglets/stabilizers. The presentations also included safety requirements for aircraft landing gear systems. As stated by Smyth, "It is interesting to note that airworthiness certificates in America for small aircraft are issued according to aircraft type, aircraft engine, or propeller." Smyth also pointed out that "many suggestions for meeting standards for flight controls systems were raised during the Workshop and taken into consideration."

Propulsion-related certification discussions covered several engine design and safety issues. The issues ranged from passenger comfort and requirements for new electronic systems to environmental concerns such as fuel emissions and noise reduction.

Pilot Training and aircraft maintenance issues were also discussed, including requirements for manuals, part replacement and upgrades, and inspections. "Cost, value, and safety continue to be major concerns at the FAA. We want to keep in line with our program objectives of reducing GA accidents 5-fold in 10 years," said Smyth.

"There was much coordination between the AGATE Technical Councils and Membership regarding certification and products that have been developed. Agreement was reached for work relations regarding the certification issues resolution process," he said.

Many participants left the Workshop with a sense of accomplishment. As stated by Curtis W. Wray, Vice President of Advanced Creations Incorporated, in a follow-up letter to Smyth, "By the end of the workshop we felt that the future holds promise. It seems that you folks represent the best in the FAA and share a common vision of the future of General Aviation in this country. More importantly, you seem to be firmly committed to making that vision an achievable reality." □

---

## AGATE Coordinates With Government Programs

### AGATE Coordinates with Government Agencies in Flight 2000, GAP, AATT, and ASIST Programs

AGATE is working with other Government programs to develop technologies that will support the vision for a small aircraft transportation system. Potential for the development of this system is now being realized at the highest levels of government. As stated by NASA Administrator Daniel S. Goldin in his "The Three Pillars of Success for Aviation and Space Transportation in the 21st Century" speech presented to the Aero Club, AIAA, and NAC on March 20, 1997:

*"The seventh goal in our Global Civil Aviation pillar is to invigorate the general aviation industry, delivering 10,000 aircraft annually within 10 years, and 20,000 aircraft annually within 20 years. . . With fail-safe avionics, ultra-reliable engines,*

*whole-airplane parachutes, and simplifications enabled by 'Free Flight,' which allows pilots to choose their own routes, small airplanes can enjoy the levels of safety previously standard only on larger aircraft."*

#### Flight 2000 and Free Flight

The FAA and AGATE are working together to bring free flight technology into widespread use. The air traffic management procedures for conducting operations using new navigational communication and surveillance systems, will be validated through a program known as FAA Flight 2000.

"Government and industry partners are working to establish



requirements for global positioning satellite (GPS) augmented systems, Wide Area Augmentation System (WAAS) and Local Area Augmentation System (LAAS) for cockpit displays, and Automatic Dependent Surveillance-Broadcast (ADS-B) datalink and databus communication systems. We are also submitting requests for multifunctional displays in the cockpit of terrain and cockpit display of traffic information (CDTI)," says David Tuttle, Flight 2000 Program Manager.

The program is building on the success of project Heli-STAR which served as a proving experiment for communication/navigation surveillance and datalink technologies at the 1996 Atlanta Olympic Games. AGATE technical teams are negotiating with the Flight 2000 planners on cockpit system equipment requirements.

General aviation, commercial, and military aircraft will participate in Flight 2000 with operations commencing in Hawaii and Alaska in the year 2000. Once the free-flight capabilities have been demonstrated in the skies over Hawaii and Alaska, similar operations and technologies will spread throughout the rest of the continental U.S. The White House has set the goal of deploying the Free Flight initial operating capability in the lower 48 states by the year 2005.

### **GAP and New Engines for General Aviation**

The effort to reduce propulsion cost for aircraft in both present and future general aviation fleets is shifting into high gear. NASA has joined industry in the effort to develop two new engines for both propeller-driven and jet aircraft under the auspices of the General Aviation Propulsion (GAP) program. The two engines, the Intermittent Combustion (IC) Engine Element and the Turbine Engine Element, form the basis of GAP. The two engine types are slated for completion by the year 2000, when the NASA/industry team will flight demonstrate prototype piston and turbofan engines for the public at the EAA Oshkosh Fly-In.

The main objective of the IC element is to cut engine prices in half while improving maintenance, operation, and passenger comfort. Teledyne Continental Motors and its partners (Aerotrónica, Cirrus Design, GS Engineering, Hartzell Propeller, Lancair International, New Piper Aircraft, and subcontractor Perkins Technology) have teamed with NASA to develop the CSD 283 four cylinder, liquid cooled, two-stroke diesel engine capable of producing 200 hp. Combined with advanced low-speed

propellers, the engine will offer quiet, efficient, vibration-free operations using jet fuel and a single lever power control (SLPC). As stated by NASA Lewis GAP Manager Leo Burkardt, "Interfacing with the AGATE Acoustic Team will be critical to the IC Engine."

The turbine engine element will address the needs of higher performance aircraft capable of cruising speeds of 200 knots or more. An extremely challenging goal for this element is to reduce the price of small turbine engines by a factor of 10 (from hundreds of thousands to tens of thousands of dollars). Williams International and its partners (California Drop Forge, Cessna Aircraft, Chichester-Miles Consultants, Cirrus Design, New Piper Aircraft, Forged Metals, subcontractors Producto Machine, Scaled Composites and consultant Raytheon Aircraft) have teamed to produce the FJX-2 lightweight high bypass ratio turbofan engine in the 700 lb thrust class. Turbine engine costs will be reduced by stressing simplification, reduced part count, advanced manufacturing processes and high production volumes. The Williams VJET-II testbed aircraft will be flown at Oshkosh '97.

### **AATT and Air Traffic**

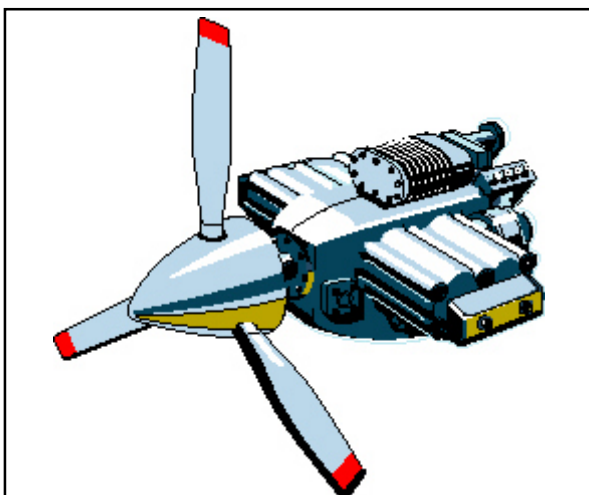
AGATE members are also active in the NASA-FAA Advanced Air Transportation Technology (AATT) Element of the Aviation System Capacity Program, a broad-based program aimed at significantly improving the capacity, efficiency, and safety of the air traffic management system for all vehicle classes. AATT focuses on human factors and automation that will assist pilots, controllers, and dispatchers develop and facilitate the free-flight concept. "We would like the program to branch out with business aircraft, commuters, and other aviation communities. Removing restrictions on the technologies has been a major concern," said AATT Program Manager Bob Jacobsen.

Key areas to be addressed in the program include delays associated with weather, indirect routing, taxi delays, and cruise inefficiencies. "We are working on improved interaction between ground control systems and aircraft. We expect to see a change in responsibilities for ground and flight crews, particularly in roles and responsibilities for IFR separation. The controller is responsible for separation but the aircrews need to be more involved," said Jacobsen.

"Through the program, we hope to take advantage of new communication technologies to help aircraft make more effective descents," he said. Air traffic at lower altitudes is concentrated in the terminal area and this can pose major problems for pilots and ground controllers, but according to Jacobsen, "there is freedom for coordination of functions and collaboration of airspace requirements. Descents have been a problem at Dallas, Ft. Worth. Currently, the FAA is responsible for making the call for the descent, but the users want to have flexibility for making the call. This flexibility requires situational awareness and, consequently, needs for better position information and displays presented to aircraft." General aviation free flight requirements are being developed and managed by the AATT Program.

### **ASIST and Light Aircraft Safety**

The President has set the national goal to "reduce fatal accidents in aviation by 80 percent." NASA and the FAA have recently collaborated on a new national initiative stimulated by this directive from the White House. Specific goals for the



**Advanced horizontally opposed four cylinder diesel engine**

(continued on page 7)

## AGATE Alliance Association, Inc. (AAAI) Ready for Business

### *Industry Takes on Administrative and Management Support Roles*

AGATE industry members have joined efforts to form the AGATE Alliance Association, Inc. (AAAI), a non-profit organization, to support and stimulate research of advanced general aviation technology. AAAI was created by the AGATE Executive Council in 1996 to manage AGATE members' administration using the flexibility offered by a non-profit business status. AAAI began interim operations in November 1996, with Mr. Paul Masson serving as interim Executive Director, until 1997 when the organization became fully operational assuming functions formerly performed by the NASA Langley General Aviation Program Office.

In June 1997, **Mr. John F. (Jack) Sheehan**, a graduate of Embry-Riddle Aeronautical University and the Defense Systems Management College, was appointed permanent Executive Director of AAAI. He is a professional aviator, with a strong



**Jack Sheehan**  
**Executive Director of AAAI**

project management and research and technology background. Mr. Masson will continue to work as Facilitator, an advisory and management support function for the Alliance leadership.

AAAI also provides a variety of research program services to the Alliance. These services include legal advice, audit support, and facilitation management as well as providing facilities for meetings, newsletters, membership information, and archival storage of data and information. AAAI offices are located at 3217 N. Armistead Ave., Suite M, Hampton, Virginia, and the office staff can be reached at 757-766-7512 or fax at 757-766-2299. □

---

### **Raytheon Receives Award of Excellence for Development of Horizontal Stabilizer**

AGATE member Raytheon Aircraft Co. received an Award of Excellence from the Composites Institute on January 29, 1997, in recognition of its development of a resin horizontal stabilizer for general aviation aircraft. The stabilizer was one of several products entered in the Development Category of the Products Awards Competition held in concert with the Composites Institute's International Composites EXPO '97. The stabilizer was manufactured using AGATE-derived Resin Transfer Molding processes. □

## AGATE Facilitator-Masson Receives NASA Public Service Medal



**Dr. Jeremiah F. Creedon (left), Director of the NASA Langley Research Center, presents the NASA Public Service Medal to Paul Masson.**

In recognition of his contributions to the AGATE Alliance since 1993 and the unique public/private management structure of the AGATE Alliance, Mr. Paul Masson was presented the prestigious Public Service Medal by NASA at its annual Honor Awards Ceremony at the Langley Research Center on June 19, 1997. This medal is the highest recognition conferred by NASA on non-NASA individuals for exceptional service to the NASA mission. □

---

## **Revitalization Efforts Soar** *(continued from page 1)*

to use, Single Lever Power Control (SLPC) systems are being flown. "Airplanes with new controls and engine systems are scheduled to be displayed at the EAA (Experimental Aircraft Association) Oshkosh Fly-In. All the preliminary tests are done for this year and we are on schedule," said Nelson.

Work is continuing on icing condition avoidance procedures, as well as new lower noise propellers. "We are making good progress particularly in terms of aircraft crash safety," said Nelson.

To train present and future pilots to these and other advanced technologies in less time and at a lower cost, AGATE has developed a series of new training products. These products will be developed by the AGATE Alliance Flight Training Curricula Work Package (see page 8). AGATE is also capturing further public interest by displaying the AGATE Cockpit Concept Demonstrator at major aviation expositions. Surveys are now being conducted at Oshkosh and planned for the Aircraft Owners and Pilots Association (AOPA) Convention in Orlando, FL, October 23-25, 1997.

Advancements are also being made regarding certification issues. "The FAA has set up the Air AGATE for specific technologies so certification will not be a stumbling block. The process for submitting certification issue papers is beginning to take form for some of these technologies now," says Nelson. "We hope that general aviation airplanes will be safer to fly, more enjoyable to fly, and cheaper to fly. We would like to make flying an airplane as easy as driving an automobile." □

## Kansas Universities Team Wins 1996-97 General Aviation Design Competition

### *Students Engage in Stimulating Studies of Advanced General Aviation Concepts*

Innovation served as a major theme in the 1996-1997 National General Aviation Design Competition. For the second time in three years, a joint design team from the **University of Kansas**, **Wichita State University**, and **Kansas State University** took first place with their "Adagio" aircraft design. The design offers performance similar to the Cessna 172R, but at a reduced cost of approximately \$75,000. Adagio is easy to build (construction time of about 200 hours), powered by a diesel engine, and features a unique inverted "V" tail.

The second place award was presented to Aerospace Engineering students at **The Pennsylvania State University**. The Penn State team design, "The Stingray," is a pusher aircraft, with a turbocharged engine, composite construction, multifunctional display cockpit, and retractable landing gear. Third place was awarded to **Virginia Tech** for an amphibious, propeller-driven, sport utility aircraft with hydraulic retractable landing gear.

A special Retrofit Award, sponsored by the Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation, was presented to **Jennifer Wilson of Princeton University** for simplification of cockpit instrumentation through the use of a heads-up-display (HUD). Wilson's award was the first competition award given for a design submitted by an individual.

The Competition is held among university student teams and faculty to involve students in general aviation revitalization. The third annual National General Aviation Design Competition was coordinated for NASA and the FAA by the Virginia Space Grant Consortium during the past academic year, and winners will be announced at the 1997 Oshkosh Fly-In.

Students are invited to compete in designing systems and subsystems of a single-pilot, fixed-wing, single-engine, propeller-driven airplane accommodating 2 to 6 passengers. Students at U.S. engineering colleges work with faculty advisors to design innovative configurations and systems that address technical and economic challenges facing the general aviation market.

Teams were asked to address the following areas: integrated cockpit systems; propulsion; noise and emissions; integrated design and manufacturing; aerodynamics; operating infrastructure; and radical new vehicle designs. The resulting designs are judged on the basis of technical superiority, cost, and aesthetic value by a panel of government, industry, and university experts. In addition to three cash prizes offered by NASA and the FAA, the AOPA Air Safety Foundation offers a cash award for the student team design with greatest retrofit potential. Winning team members receive cash awards of up to \$3,000 and the university department of the first place team receives a \$5,000 cash award for their efforts.

The 1997-98 competition features two new awards, the EAA "Design It, Build It, Fly It" award and an Air Force Research Laboratory dual use technology award. Guidelines can be obtained from the Virginia Space Grant Consortium in August at 757/865-0726 or via e-mail at the following address: msandy@pen.k12.va.us. □

## AGATE Coordinates With Government

(continued from page 5)

program include reducing the fatal accidents by a factor of 5 in 10 years, and by a factor of 10 in 20 years. Preparation for planning the necessary research program to achieve these aggressive goals began in early spring 1997 with the formation of an effort named the Aviation Safety Investment Strategy Team (ASIST) Process.

ASIST activities consisted of government, industry, DoD, and university representatives meeting for a series of four in-depth workshops to discuss accident causal factors, issues, and solutions involving approaches to accident prevention, mitigation, and modeling. Specific requirements for technology development for the general aviation community were considered by the participants, who included a number of AGATE members.

The new safety program is scheduled to begin in 1998 through NASA funding. "AGATE is following up on recommendations from NASA and has served as an effective means for working with the general aviation industry," said Mike Lewis, Manager of NASA's new Safety Initiative. AGATE and the ASIST program are coordinating investments in safety technologies. □

### Schedule of Events

#### July 30-August 5:

Oshkosh, WI  
AGATE Concept Demonstrator, NASA  
AGATE/GAP and SBIR exhibits, and  
AGATE Demonstrator Aircraft exhibits  
at new East Building Hangar

#### August 1:

Oshkosh, WI  
AGATE Press Conference,  
NASA-FAA-AOPA National General  
Aviation Design Competition Winners

GAP Program Press Conference,  
Williams Int'l. GAP Turbine Engine  
Testbed Aircraft, VJET-II

#### August 2:

Oshkosh, WI  
GA R&D Press Conference

#### August 5-7:

Oshkosh, WI  
AGATE Annual All-Members'  
Plenary Session  
AGATE Executive Council  
and Technical Council Meetings  
(principal members)

#### August 20-22:

Norfolk, VA  
Virginia Aviation Conference

#### September 8-10:

Tulsa, OK  
NASAO Conference

#### September 9-10:

Kansas City, MO  
Air AGATE/SAWP Meeting

#### September 16-18:

Orlando, FL  
RTCA

#### September 23-25:

Dallas, TX  
National Business  
Aircraft Association (NBAA)

#### October 9-10:

NATA Flight  
Training Meeting

#### October 15-16:

Washington, DC  
FY 1988 Executive  
Council Meeting

#### October 23-25:

Orlando, FL  
AOPA EXPO '97  
AGATE Concept  
Demonstrator public  
display

#### November 18-20:

Williamsburg, VA  
AGATE Annual  
Planning Retreat

#### December 9-10:

Flight Systems  
Technical Council  
Meeting

Crash Workshop  
NIAR

## AGATE Alliance Flight Training Curricula Work Package

“The Executive Council (EC) of the Advanced General Aviation Transport Experiment (AGATE) consortium wishes to form a strategic alliance with the Federal Aviation Administration (FAA) in the area of flight training curricula. New standards and methods for pilot certification are a critical element of the AGATE concept that revolutionizes situational awareness and flight safety for the future general aviation pilot.”

— Letter from Randy Nelson, Chairman, AGATE Executive Council and Cessna Aircraft Company to Guy Gardner, Associate Administrator, Regulation and Certification, AVR-1, FAA

The FAA and NASA have established an agreement on funding and leadership for the FAA-led Flight Training Curricula Work Package. NASA has agreed to provide \$1.5 million for the FY 1998 project year, with the FAA to provide funding in the out-years. The FAA leadership team includes Mr. Peter Hwoschinsky, AND-710, Mr. John Lynch, AFS-830, and Mr. Hooper Harris, Orlando FSDO. The industry members of the work package formed one Curriculum Development Team and submitted a proposal for review by the Government Partners. The final announcement of the terms and conditions for the industry team selection is awaiting approval by the FAA Selecting Official and announcement at Oshkosh '97. The team submitting the proposal is led by Embry-Riddle Aeronautical University, with team members including Jeppesen-Sandersen, Advanced Creations Inc. (ACI), Cessna Aircraft, Raytheon Aircraft, and the Florida Institute of Technology. Before final approval of the 1998 Research plan, extended team members from other universities and aircraft manufacturers will be included. The schedule of tasks planned for the Work Package is as follows:

### October 1, 1997 to September 30, 1998

- 1) **Unified (“One-Step”) Instrument-Private Pilot Curriculum** A new course is being developed for AGATE that will serve as the standard for training contemporary and future general aviation pilots. The cost-effective course will accelerate pilot training and certification using aircraft of today by combining private and instrument flight training syllabi into a single curriculum. The course will involve the use of existing equipment for training purposes and set aircraft equipment requirements. The course is intended to result in substantial reductions in training time and costs. Students will be evaluated according to private and instrument pilot Practical Test Standards (PTS). The results of this curriculum validation effort will serve as a benchmark for the following tasks 2-8.
- 2) **Integrated Cockpit Information System Display (ICIS) Learning Module** As a supplement to the unified instrument-private curriculum an Integrated Cockpit Information System (ICIS) display module will be instituted that includes several piloting functions designed to reduce workload. Flight planning/replanning, weather, navigation, pilot-owner handbook usage, Cockpit Display of Traffic Information (CDTI), and aircraft systems management will be included. Students will be evaluated according to the Private

Pilot/Instrument Rating PTS, with final evaluations being provided to the Flight Systems Work Package. These display systems and training procedures will be valuable in supporting the FAA Flight 2000 goals.

- 3) **Propulsion System Management (Single Lever Power Control [SLPC]) Learning Module** In tandem with the unified instrument-private curriculum and ICIS display module, the PSM Learning Module will integrate critical elements of propulsion systems operations including powerplant operations, engine diagnostics, and abnormal operations. Students will be evaluated according to the Private Pilot/Instrument Rating PTS, with final evaluations being provided to the Propulsion Sensors & Controls Work Package.

### October 1, 1998 to September 30, 1999

- 4) **Primary Flight Display (PFD) Learning Module** In combination with the unified instrument-private curriculum, ICIS, and SLPC, a Primary Flight Display (PFD) Learning Module will be developed that includes flight director-style navigation information, terrain following PFD, and improved traffic following PFD. Students will be evaluated according to the Private Pilot/Instrument Rating PTS, with final evaluations being provided to the Flight Systems Work Package.
- 5) **Icing Condition Operations Learning Module** As a supplement to the ICIS, PFD, and SLPC Modules, an Icing Condition Operations Learning Module will give students the opportunity to learn more about advanced operations intended to avoid the effects of hazardous ice formation on aircraft. The Module offerings include flight planning/replanning, ice avoidance, deicing operations, and ice buildup. Students will be evaluated according to the Private Pilot/Instrument Rating PTS, with final evaluations being provided to the Ice Protection Systems Work Package.
- 6) **Free Flight Learning Module** In preparation for FAA Flight 2000, a Free Flight Learning Module will be offered that incorporates Datalink Communications capabilities among other ICIS related subjects. The module is specifically designed for pilots in Hawaii and Alaska. The Free Flight Learning Module will be provided to the FAA Flight 2000 project team.

### October 1, 1999 to September 30, 2000

- 7) **Integrated AGATE Curriculum** The Integrated AGATE Curriculum will culminate all modules successfully completed and offer a comparison between data obtained in the baseline unified instrument-private curriculum. Students will be evaluated according to the Private Pilot/Instrument Rating PTS. The goal is to demonstrate substantial savings in training cost and higher proficiency compared to the benchmark curriculum. This curriculum will incorporate all of the previous AGATE components from tasks 2-6.

### October 1, 2000 to September 30, 2001

- 8) **General Aviation Propulsion (GAP) Turbine Aircraft Learning Module** As part of the unified instrument-private curriculum, students will have the opportunity to learn about advanced general aviation engine operations through a GAP Turbine Aircraft Learning Module. The module will include enhanced altitude and speed for single-engine turboprop-powered aircraft outfitted with the latest AGATE cockpit and deicing equipment, and provide information required for the FAA to determine the pilot rating process for such aircraft. Final evaluations will be provided to the GAP Program team.



---

# Management and Technical Progress Highlights

---

## Flight Systems

In preparation for Flight 2000, AGATE Flight Systems technical teams are continuing development and implementation of new communications, navigation, surveillance, and display technologies and operational procedures for free flight.

Principal Member NavRadio has achieved a technical breakthrough in the form of an affordable software radio for VDL Mode 2 Flight Information Systems Datalink applications.

The AGATE Flight Systems Communications Team has established a transition plan for affordable communications systems capable of bringing advanced digital radio features and capabilities to GA cockpits.

Associate Member Airborne Research Associates is continuing its development of the Airborne Total Lightning Advisory System (ATLAS), designed to provide pilots with lower cost lightning and storm intensity information.

Associate Member company Seagull, Inc., has completed their SBIR Phase II development of an affordable, GPS-based, solid-state Attitude and Heading Reference System. Further development of the concept is being coordinated with the Flight Systems team.

The AGATE Concept Demonstrator and a Cessna 210 aircraft, equipped with multifunctional navigational and weather displays and low-cost datalink communication equipment, will be displayed at Oshkosh by AGATE.

---

## Propulsion Sensors and Controls

A Cessna 182 aircraft equipped with the mechanical Single Lever Power Control (SLPC) will be test flown in July and is scheduled for display at Oshkosh.

As part of SBIR Phase II, a Cessna O-2A with an electronic engine control system outfitted by Aurora Flight Sciences, will be flight tested in July and is currently scheduled for display at the 1997 Oshkosh Fly-In.

The Ohio State University completed the Supporting Member task to validate an IC engine transient model. The work originated under grant to NASA LeRC and Honeywell is presently using the validated engine model for Diagnostic development work on IC engines.

---

## Integrated Design and Manufacturing (ID&M)

The Global Aircraft Corporation has developed a new composite propeller for general aviation aircraft known as the Quasi-Constant Speed Composite (QCS) Propeller. The lightweight propeller offers several performance advantages over conventional metal propellers including improved take-off capability, airspeed, thrust, and quieter flights. The propeller will be on display at Oshkosh.

The Integrated Design and Manufacturing (ID&M) Task Group reported that a new AGATE composite material database will be established from new composite certification procedures. The Group is also working on a new qualification process for composite aircraft components. The new materials database and processes save manufacturers significant time and cost.

---

## Ice Protection Systems

The Ice Protection Systems Work Package members attended the National Center for Atmospheric Research (NCAR) held in Boulder, CO, June 3-4. The Work Package observed weather systems that might be incorporated in the icing avoidance and exit systems of AGATE aircraft.

Tests of the first entry of two ice protected NLF wings was conducted on June 13 in the NASA LeRC Icing Research Tunnel (IRT). A second entry, with two additional protected wings, was conducted on July 3.

---

## Systems Assurance

Baselining of AGATE Systems engineering documents was completed for the month of June and the Work Team is continuing work with the FAA on certification issues.

---

*For media information, please contact: Keith Henry, NASA Langley Research Center, Office of Public Affairs,  
Mail Stop 115, Hampton, VA 23681-0001 (757) 864-6124*

# AGATE ALLIANCE MEMBERSHIP

## Work Packages:

Flight Systems (FS)  
 Propulsion Sensors & Controls (PS&C)  
 Integrated Design & Manufacturing (ID&M)  
 Ice Protection Systems (IPS)

AGATE Integration Platforms (AIP)  
 Flight Training Curricula (FTC)  
 Airspace Infrastructure (AI)

Program Analysis (PA)  
 Systems Assurance (SA)

**Type of Membership:** P = Principal; A = Associate

## Work Package Membership

**Official Organization Name**      **FS**   **PS&C**   **ID&M**   **IPS**   **AIP**   **FTC**

Aircraft Modular Products      P

Allied Signal Aerospace Company      P

Airborne Research Associates      A

ARINC      P

ARNAV      P

AvroTec      P

BFGoodrich Aerospace      P

Cessna Aircraft Company      P      P      P      P      P      P

Cirrus Design Corporation      P      P      P

Cox and Company      P

Digital Equipment Corp.      P

Embry-Riddle Aeronautical Univ.      P      P

Florida Institute of Technology.      P

Global Aircraft Corp.      P      P

Harris Corporation-ATCSD      P

Honeywell Technology Center      P

Innovative Dynamics, Inc.      P

Jeppesen Sanderson Co.      P      P

Kestrel Aircraft Company      P

Lancair International Inc.      P      P

NavRadio      P      P

Ohio State University      P

## 1997 AGATE Consortium Supporting Members

Advanced Creations Inc.  
 AEROCAR LLC  
 Aircell, Inc.  
 AOPA-Air Safety Foundation  
 BIHRLE Applied Research Inc.  
 CTA Simulation Systems  
 Experimental Aircraft  
 Association (EAA)  
 General Aviation Manufacturers  
 Association (GAMA)  
 Georgia Tech Research Institute  
 Hartzell Propeller Inc.  
 Kansas State University  
 (EPSCOR Team)  
 Mississippi State Univ-Raspert Labs  
 Research Center  
 MITRE Corporation  
 Mod Works  
 National Air Transportation  
 Association (NATA)  
 National Business Aircraft  
 Association (NBAA)  
 National Center for Atmospheric  
 Research (NCAR)  
 New Piper Aircraft, Inc.  
 Seemann Composites Inc.  
 Small Aircraft Manufacturers  
 Association (SAMA)  
 University of Central Florida  
 University of Kansas  
 University of Tennessee  
 Space Institute  
 University of Illinois at Urbana  
 Champaign  
 Williams International

**Work Packages:**

Flight Systems (FS)  
 Propulsion Sensors & Controls (PS&C)  
 Integrated Design & Manufacturing (ID&M)  
 Ice Protection Systems (IPS)

AGATE Integration Platforms  
 Flight Training Curricula (FTC)  
 Airspace Infrastructure (AI)

Program Analysis (PA)  
 Systems Assurance (SA)

**Type of Membership:** P = Principal; A = Associate

Official Organization Name	Work Package Membership								
	FS	PS&C	ID&M	IPS	AIP	FTC	AI	PA	SA
Raytheon Aircraft Company	P	P	P			P		P	
Raytheon CO/E Systems-Space Montek Div.	P	P				P		P	
Rockwell Collins Commercial Avionics							P		
Ross Engineering Company	P					P			
Seagull Technology, Inc.	A						A		
Simula Government Products Inc.			P				P		
Stoddard-Hamilton Aircraft, Inc.			P						
Teledyne Continental Motors								P	
Textron Lycoming Reciprocating Engine Div								P	
Trimble Navigation Ltd.	P							P	
Unison Industries		P						P	
United Technologies Hamilton Standard		P						P	
University of North Dakota							P	P	
WSU-National Institute for Aviation Research			A		A			A	

**Government Partners**

Federal Aviation Administration (FAA)  
 National Aeronautics and Space Administration (NASA)  
 USAF Research Laboratories (Wright Directorate)

# **The AGATE Flier**

Volume III, Issue 1      July 1997

**The AGATE Flier** is published by the AGATE Alliance Association, Inc., a private, non-profit, membership organization founded to stimulate the development and dissemination of general aviation technology. **The AGATE Flier** reports on progress in a family of technology initiative and public/private aviation-related activities to revitalize the U.S. GA industry, called AGATE-Advanced General Aviation Transport Experiments. The NASA Langley Research Center is the lead center for this program.

For address corrections and additions, please write to:

**The AGATE Flier**

c/o AGATE Alliance Association, Inc.  
3217 North Armistead Ave., Suite M  
Hampton, VA 23666

For more information about AGATE please see the following website: <http://agate.larc.nasa.gov>

For media information concerning NASA's General Aviation Programs please contact:

Keith Henry  
NASA Langley Research Center  
Office of Public Affairs  
Mail Stop 115  
Hampton, VA 23681-0001  
(757) 864-6124

# **The AGATE Flier**

c/o AGATE Alliance Association, Inc.  
3217 North Armistead Ave., Suite M  
Hampton, VA 23666  
**(757) 766-7512**

Address correction requested

## **Contents:**

---

Page 1	<b>Revitalization Efforts Soar With AGATE</b> <i>AGATE helps general aviation reach new heights through new initiatives.</i>
Page 2	<b>From the Desk of the Program Manager</b> <i>Bruce Holmes</i>
Page 3	<b>SBIR/STTR:Ingredients for Success</b> <i>Displays showcase general aviation successes</i>
Page 4	<b>AGATE Holds First Certification Workshop</b> <i>Air AGATE works to set general aviation standards</i>  <b>AGATE Coordinates With Government</b> <i>AGATE coordinates with government agencies in Flight 2000, GAP, AATT, and ASIST Programs</i>
Page 6	<b>AGATE Alliance Association, Inc. (AAAI) Ready for Business</b> <i>Industry Takes on Administration and Management Support Roles; New Executive Director Selected</i>  <b>Raytheon Receives Award of Excellence for Development of Horizontal Stabilizer</b> <i>Raytheon receives Award of Excellence for development of resin composite stabilizer</i>  <b>AGATE Facilitator-Masson Receives NASA Public Service Medal</b> <i>Paul Masson receives NASA Public Service Medal for contributions to AAAI formation</i>
Page 7	<b>Kansas Universities Team Wins 1996-97 General Aviation Design Competition</b> <i>Students engage in stimulating studies of advanced general aviation concepts</i>  <b>Schedule of Events</b>
Page 8	<b>AGATE Alliance Flight Training Curriculum</b> <i>AGATE establishes flight training curriculum for future</i>
Page 9	<b>Technical Progress</b> <i>The latest in AGATE work package progress</i>
Page 10	<b>AGATE Work Package Members</b> <i>A complete listing of present work package members</i>

**Bulk Rate  
U.S. Postage  
PAID  
Hampton, VA  
Permit No. 173**